FIVE NEW SPECIES OF *CLIMOCELLA* N. GEN. (PUNCTOIDEA: CHAROPIDAE)

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Abstract. Climocella n. gen. is established to hold a group of charopid snails (family *sensu* Solem, 1979; 1982) with spirally lirate protoconchs that were left without a name when Climo (1981) used *Mocella* for the radially costate group then known as *Subfectola*. *Climocella akarana* n. sp., *C. cavelliaformis* n. sp., *C. haurakiensis* n. sp., *C. kaitaka* n. sp. and *C. rata* n. sp. are described, all living in Auckland and its environs. *C. maculata* (Suter, 1890) is redefined.

Iredale (1915), reviewing *Manual of the New Zealand Mollusca,* gave the name *Mocella* to Suter's group of *Endodonta corniculum* (Reeve, 1852), which had a "protoconch spirally striate". He selected *Helix corniculum* Reeve, 1852 as the type for this genus. Species in the genus were *Mocella alloia* (Webster, 1904), *M. corniculum* (Reeve, 1852), *M. kenepuruensis* (Suter, 1909), *M. prestoni* (Sykes, 1895), *M. segregata* (Suter, 1894) but he did not recognise *M. corniculum* var. *maculata* (Suter, 1891). Additions to the genus were *M. manawatawhia* (Powell, 1935), *M. accelerata* (Climo, 1970) but *M. alloia* was synonymised with *Allodiscus urquharti* Suter, 1894 (Climo 1970). Iredale (1941:91) found that *H. corniculum* had been used previously by Reeve so he substituted the name *Mocella cogitata* but Climo (1970) pointed out that a new name for the New Zealand *corniculum* was not needed as *Helix eta* Pfeiffer, 1853 was available. Climo (1970) also synonymised *M. kenepuruensis* and *M. corniculum* var. *maculata* with *M. eta*. Climo (1981) found that the holotype of *Helix eta* (British Museum (Natural History) reg. no. 1962725; this number was recorded only in his 1970 paper) had a protoconch with axial striations and a shell which he considered to be identical with one known to earlier collectors by the species name *caputspinulae* (Reeve, 1852) and finally placed by Powell (1939) in a subgenus *Fectola (Subfectola)*. Climo (1981) further found that the holotype of *Helix caputspinulae* Reeve, 1852, the type species for *Subfectola* (British Museum (Natural History) reg. no. 1962724), had also been misidentified and was a snail in the pulmonate family Punctidae Morse,1864. The name *caputspinulae* thus became the earliest for the type species of *Paralaoma* Iredale, 1913 and *Subfectola* a synonym of *Paralaoma*. Roth (1987) covers the synonymies of the widely distributed and much named *Paralaoma caputspinulae* in more detail. Climo then used the name *Mocella* to describe the former members of *Subfectola* and the type for the genus became *Mocella eta* Pfeiffer, 1853. Because of the complexity of the changes, under "Systematics" I have given full synonymies of the type species for *Mocella* and *Fectola* up to 1981. Note that Climo (1978) found another misidentification in the type species of *Fectola* so that the genus in the list below is not the present day *Fectola*, but the one envisaged by Iredale.This use of Iredale's names in a sense differing from his original intent caused some confusion and Hazelwood (1991) discusses the implications in greater depth.

Climo (1981) failed to formally supply a name for the remaining genus after he transferred the name *Mocella.* In this paper I therefore propose a new genus, *Climocella,* based on *maculata* Suter, 1890 and four of the new species described below. The group is

distinctive in having up to 12 lirae on the protoconch. In a more general way the individual species have 3.5 to 4.5 accelerating whorls, post-nuclear sculpture of axial ribs with finer axials between, microscopic spiral sculpture sometimes going over the primary axials and a moderately open umbilicus. The spire is sunken to slightly raised and shells are uniform white or colour patterned. Although protoconch sculpture alone is not sufficient to hold species within a genus when anatomical details may suggest other affinities, it has been a very convenient feature for separating this group and I will maintain the status quo for this paper. Solem (1983: 167, 168) transferred some Pacific snails from *Mocella* to *Sinployea* Solem, 1983 on evidence from dissected penial material but stated his action was "somewhat arbitrary".

On shell features only, members of the group are difficult to separate and previous workers have relied heavily on finer protoconch details. Auckland is one area in which the genus is prominent but it has always been difficult to ascertain the number of species present or to satisfactorily separate them. This paper is limited to describing five species from around Auckland that differ in a mixture of shell and anatomical features, without giving total distribution details, and redefining *C. maculata* which has a southern distribution and on which the new genus will be based. Four of these species, and perhaps five, were represented in the list of material examined by Climo (1970:316) and designated "*Mocella eta*". The illustration he gave of this species was of a shell from Rangitoto which was almost certainly *Climocella haurakiensis* n. sp. Anatomical details have been published for *C. maculata* by Climo (1970:351, fig. A), *C. manawatawhia* by Climo (1973:614, fig. F) and an unnamed species from Te Paki, Northland by Climo (1970:351, fig. C). *C. manawatawhia* is confined to the Three Kings Islands on present evidence.

In the present study drawing has been freehand from material viewed under a dissecting microscope up to 100X magnification with a linear graticule. Illustrations of shells (Figs 1-9), protoconchs (Figs 10-17) and anatomy (Figs 18-49) are grouped together for comparative purposes. I have endeavoured to show salient features of anatomy that will facilitate separation of species without detailed dissection. The scanning electron micrographs were kindly made available by the Museum of New Zealand from images held on file.

The taxon descriptions and distributions given in this paper are based on specimens held in the Auckland Museum (AIM; lot numbers preceded by "AK") and the Museum of New Zealand (NMNZ; lot numbers preceded by "M"). The initial digits 123 have been dropped from the M numbers in the lists of "Other Material Examined". For type material, the number of specimens is given in parentheses following the accession number. The following names, which appear often in the distribution records, are referred to by initials only: F.M. Climo, J.F. Goulstone, B.F. Hazelwood, P. Mayhill, D.J. Roscoe. Map references are from the N.Z.M.S. 260 series and all dates refer to the 20th century.

SYTEMATICS

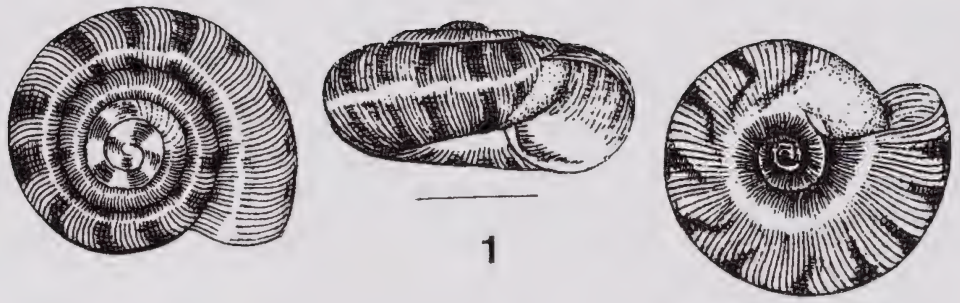
SUPERFAMILY: PUNCTOIDEA Morse, 1864.
FAMILY: CHAROPIDAE Hutton, 1884.

GENUS: *MOCELLA* Iredale, 1915

TYPE SPECIES: *Helix corniculum* Reeve, 1852 (by original designation).

1852 *Helix corniculum* Reeve (1851 = 1852): *Conch. Icon.*, 7, pl. 133, fig. 826 (non Reeve, 1852, pl. 92, fig. 502).

1853 *Helix eta* Pfeiffer: *Monog. Heliceorum viventium* 3:107.



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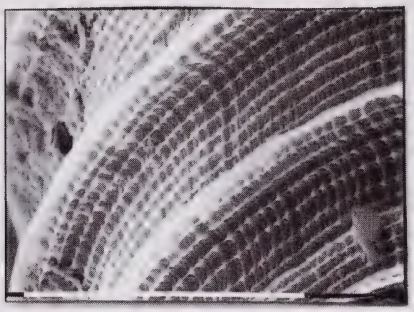

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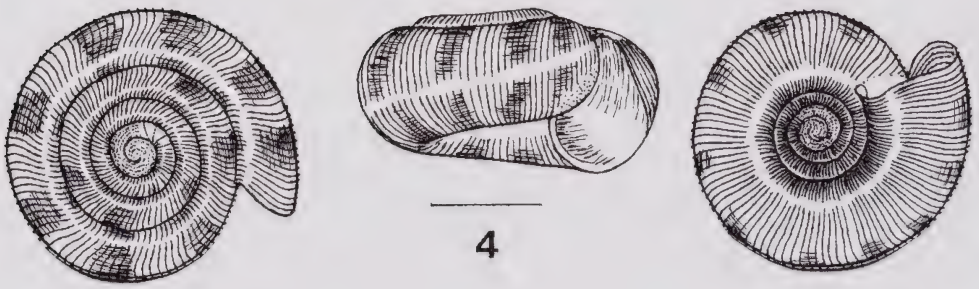

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Figs 1-4. Shell details. Scale line on line drawings = 1 mm, on micrograph each division = 0.1 mm. 1. *Climocella maculata* (Suter), Mt. Cook, Hooker Valley, Governors Bush, A.E.Brookes c. 1930, 2.6 mm x 1.4 mm (AK85035). 2. *C. akarana* n. sp., Clevedon, 2.5 mm x 1.25 mm (holotype AK72702). 3. *C. akarana* n. sp., Waiuku (M.69276). 4. *C. cavelliaformis* n. sp.,Waiwera, 2.75 mm x 1.4 mm (holotype AK72704).

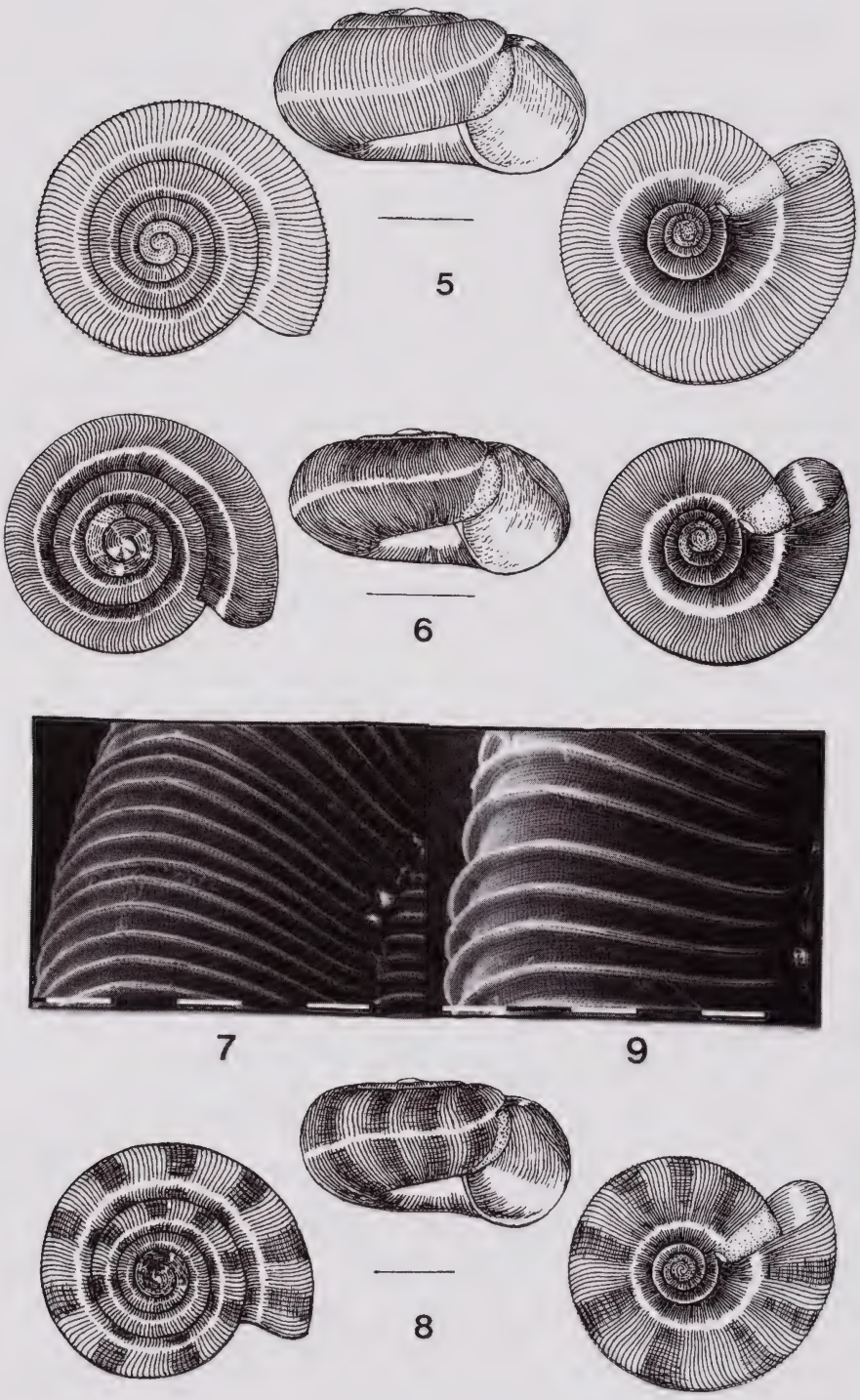
1878 *Patula eta* (Pfr.): *Nomencl. Hel. Viv*: 98.
1884 *Patula corniculum* (Rve.): Hutton, *Trans. N.Z. Inst.* 16:192.
1890 *Patula corniculum* var. *maculata* Suter, *Trans. N.Z. Inst.* 23:89.
1892 *Patula eta* var. *maculata* (Suter): Pilsbry, *Man. Conch.* 2(8):96.
1893 *Charopa corniculum* (Rve.): Hedley & Suter, *Proc. Linn. Soc. N.S.W.* 2(7):655.
1893 *Charopa corniculum maculat*a (Suter): Hedley & Suter, *Proc. Linn. Soc. N.S.W.* 2(7):655.
1894 *Endodonta (Charopa) corniculum* (Rve.): Suter, *J. Conchyliol.* 41:264.
1894 *Endodonta (Charopa) corniculum maculata* (Suter): *J. Conchyliol.* 41:265.
1909 *Endodonta (Charopa) kenepuruensis* Suter: *Proc. Malac. Soc. Lond.* 8:218.
1915 *Mocella corniculum* (Rve.): Iredale, *Trans. N.Z. Inst.* 47:482.
1915 *Mocella kenepuruensis* (Suter): Iredale, *Trans. N.Z. Inst.* 47:482.
1937 *Mocella corniculum* (Rve.): Powell, *Shellfish of New Zealand*: 89.
1941 *Mocella cogitata* Iredale: *Australian Zoologist* 10:91.
1946 *Mocella cogitata* Iredale: Powell, *Shellfish of New Zealand,* 2nd ed.: 94. Also 3rd ed., 1958:119, and 4th ed. 1962:112, 1967:112.
1970 *Charopa (Mocella) eta* (Pfr.): Climo, *Rec. Dom. Mus.* 6(18):314.
1976 *Charopa (Mocella) eta* (Pfr.): Powell, *Shellfish of New Zealand.* 5th ed.:116.
1979 *Charopa (Mocella) eta* (Pfr.): Powell, *N.Z. Mollusca:* 310.

GENUS: *FECTOLA* Iredale, 1915

SUBGENUS: *SUBFECTOLA* Powell, 1939.
TYPE SPECIES: *Helix caputspinulae* Reeve, 1852.
1852 *Helix caputspinulae* Reeve: *Conch. Icon.*: 7, pl. 133, fig. 818.
1853 *Helix epsilon* Pfeiffer: *Monog. Heliceorum viventium* 3:97.
1878 *Patula (Charopa) epsilon* (Pfr.): *Nomencl. Hel. Viv.*: 97.
1880 *Paryphanta epsilon* (Pfr.): Hutton: *Man. N.Z. Moll.*: 23.
1884 *Microphysa caputspinulae* (Rve.): Hutton, *Trans. N.Z. Inst.* 16:194.
1887 *Patula (Microphysa) epsilon* (Pfr.): Tryon, *Man. Conch.* 2(3):102.
1893 *Charopa caputspinulae* (Rve.): Hedley & Suter, *Proc. Linn. Soc. N.S.W.* 2(7):659.
1894 *Endodonta (Charopa) caputspinulae* (Rve.): Suter, *J. Conchyliol.* 41:266.
1913 *Endodonta (Charopa) caputspinulae* (Rve.): Suter, *Manual of N.Z. Mollusca*: 715.
1915 *Fectola caputspinulae* (Rve.): Iredale, *Trans. N.Z. Inst.*: 481.
1939 *Fectola (Subfectola) caputspinulae* (Rve.): Powell, *Rec. Auck. Inst. Mus.* 2(4):238.
1946 *Fectola (Subfectola) caputspinulae* (Rve): Powell, *Shellfish of New Zealand*, 2nd ed.:94. Also 3rd ed., 1958:119, 4th ed., 1962:112, 1967:112 and 5th ed., 1976:116.
1970 *Charopa (Subfectola) caputspinulae* (Rve): Climo, *Rec. Dom. Mus.* 6(18):330.
1979 *Charopa (Subfectola) caputspinulae* (Rve.): Powell, *N.Z. Mollusca*: 309.
1981 *Mocella eta* Pfeiffer = *Subfectola caputspinula*e sensu Powell 1939 not Reeve 1852: Climo, *Rec. Nat. Mus.* 2(3):9.

GENUS: *CLIMOCELLA* n. gen.

TYPE SPECIES: *Patula corniculum* var. *maculata* Suter, 1890.
Helix of authors (not of Linnaeus, 1758).
Patula of authors (not of Held, 1837).
Endodonta of authors (not of Albers, 1850).
Charopa of authors (not of Albers, 1860).
Mocella Iredale, 1915. Type species *Helix corniculum* Reeve 1852 (original designation) (preoccupied) = *Helix eta* Pfeiffer, 1853 = *Mocella cogitata* Iredale, 1941.
Mocella: Powell (1937, 1946, 1957, 1961, 1967).
Charopa (Mocella): Climo (1970).
Charopa (Mocella): Powell (1976, 1979).
Type specimen *Helix eta* Pfeiffer, 1853 misidentified, Climo (1981).



Figs 5-9. Shell details. Scale line on line drawings = 1 mm, on micrographs each division = 0.1 mm. 5. *Climocella haurakiensis* n. sp., The Noises, 3.45 mm x 2.1 mm (holotype AK72707). 6. *C. kaitaka* n. sp., Clevedon, 2.65 mm x 1.45 mm (holotype AK72709). 7. *C. kaitaka* n. sp., Mercer (M.69257). 8. *C. rata* n. sp., Hunua Ranges, Whakatiwai, 3 mm x 1.7 mm (holotype AK72713). 9. *C. rata* n. sp., Hapuakohe Range (M.63494).

"Mocella": Brook & Goulstone (1995:8), Goulstone (1983:20-21, 1986:11, 1990:25, 1991:9, 1992:20), Goulstone *et al.* (1993:11), Mayhill (1994:51), Solem, Climo & Roscoe (1981:477).

ETYMOLOGY: Named for Dr Frank Climo.

GENERIC DESCRIPTION

Shell up to 3 mm in diameter. Four whorls, subdiscoidal. Spire flat or slightly convex, umbilicate, with straight, sinuous or slightly protractive axial ribs and fine secondary axials reticulated by spiral lirae. Ribs sharp, or rounded with the microscopic spiral lirae running over them. Protoconch with up to 12 prominent spiral striae often with a denser layer of spiral sculpture visible underneath. In some species the final section of the protoconch has axials which may be quite strong and wider apart than the teleoconch ribs or weaker and angled causing a cross-hatcing with the spirals. Colour can be uniform white, brown or with a colour pattern of reddish brown axial bands or blotches over a white or straw background. Animal white, some species with a little white pigmentation on the albumen gland and stomach. A prominent epiphallus about the length of the expanded section of the penis, often inflated where it joins the vas deferens. Tubular base of spermathecal duct, oviduct and distal portion of the penis, usually long, thin and of similar length, often lying together and hard to separate in the retracted animal. Kidney bi-lobed, pericardial lobe much larger in some species. This generic description is based on the species *Climocella maculata* (Suter, 1890), *C. akarana* n. sp., *C. cavelliaformis* n. sp., *C. kaitaka* n. sp. and *C. rata* n. sp.

Climocella maculata (Suter, 1890) new combination Figs 1, 10, 18-21, 50

Patula corniculum var. *maculata* Suter, 1890, *Trans. N.Z. Inst.* 23:89.
Patula eta var. *maculata* (Suter): Pilsbry (1892), *Man. Conch.* 2(8):96.
Charopa corniculum (Rve.) (in part): Hedley & Suter (1893), *Proc. Linn. Soc. N.S.W.* 2(7):655.
*Charopa corniculum maculat*a (Suter): Hedley & Suter (1893), *Proc. Linn. Soc. N.S.W.* 2(7):655.
Endodonta (Charopa) corniculum (Rve.) (in part): Suter (1894), *J. Conchyliol.* 41:264.
Endodonta (Charopa) corniculum maculata (Suter): Suter (1894), *J. Conchyliol.* 41:265.
Endodonta (Charopa) kenepuruensis Suter, 1909 (in part), *Proc. Malac. Soc. Lond.* 8:218.
Mocella corniculum (Rve.) (in part): Iredale (1915), *Trans. N.Z. Inst.* 47:482.
Mocella kenepuruensis (Suter) (in part): Iredale (1915), *Trans. N.Z. Inst.* 47:482.
Mocella corniculum (Rve.) (in part): Powell (1937), *Shellfish of New Zealand*: 89.
Mocella cogitata Iredale, 1941 (in part), *Australian Zoologist* 10:91.
Mocella cogitata Iredale (in part): Powell (1946), *Shellfish of New Zealand,* 2nd ed.:94. Also 3rd ed., 1958:119, and 4th ed. 1962:112, 1967:112.
Charopa (Mocella) eta (Pfr.) (in part): Climo (1970), *Rec. Dom. Mus.* 6(18):314.
Charopa (Mocella) eta (Pfr.) (in part): Powell (1976), *Shellfish of New Zealand.* 5th ed.: 116.
Charopa (Mocella) eta (Pfr.) (in part): Powell (1979), *N.Z. Mollusca:* 310.
"Mocella" maculata (Suter, 1890): specimens in the Museum of N.Z. collections and known as such to N.Z. malacologists.

ETYMOLOGY: Derived from Latin, *macula* is a spot or mark.

REDESCRIPTION

Shell small, up to 2.7 mm x 1.4 mm, of 3.5 whorls, the last somewhat expanded, subdiscoidal, spire raised a little, suture moderately impressed. Protoconch of 1.25 whorls,

with 9 spiral lirae that stop at some widely spaced slightly oblique axials in the last quarter whorl (Fig. 10). These axials are sometimes weak or can be missing. Teleoconch with strong ribs, rounded on top, nearly straight. Interstices (about 1.5 times the width of the rib at most) with fine axials and weaker microscopic spirals. Ribs on the first teleoconch whorl number about 58 and on the final whorl 23 per mm. Umbilicus diameter about a quarter of the shell width, gradate. Colour horny with rather dull reddish brown axial bands at irregular intervals.

Penis a narrow rather knobbly tube leading from the atrium into an irregularly shaped thicker organ. Epiphallus about the same length as the whole penis, entering the penis apex alongside the insertion of the short but thick retractor muscle. Epiphallus with a small bulge on one side where it joins vas deferens. Vagina long. Base of spermathecal duct relatively short and narrow, about two thirds length of vagina and one third its width. Spermoviduct with prominent, ovate, colourless bulge on one side, with oesophagus imbedded in a groove along this swelling (Fig. 20), prostatic gland set into it proximally and salivary glands nestled against distal end. Hermaphroditic duct exiting about half way along the albumen gland with long straight thickened section (1.25 mm approx.). Hermaphroditic glands positioned a third of the way along the digestive gland (Fig. 21). Kidney weakly bilobed, pericardial lobe stronger than rectal lobe.

REMARKS

The type specimens come from Hooker Valley, Mt. Cook. At the time of writing three of these types were affected with museum disease but easily recognisable as *Climocella maculata*. Climo (1970) records three syntypes with measurements but there were actually four syntypes in the tube and one (M.125411) is not *C. maculata*. I have chosen a lectotype from the three similar specimens. This shell description is of a specimen from the type locality collected by A.E. Brookes c. 1930 (AK85035, Fig. 1). The anatomical description was based on the dissection of one snail from Pongaroa, Hawkes Bay, collected by D.J. Roscoe 19/4/70, and appears identical with the dissection recorded by Climo (1970:351, fig. A) from Banks Peninsula.

From his distribution list Suter clearly considered all the coloured *Mocella* species as variety *maculata.* Climo (1970) sank *maculata* (Suter, 1890) to synonymy of *Mocella eta* (Pfeiffer, 1853). *C. maculata* can be recognised by its accelerating whorls, blotchy colour pattern, few or lack of secondary radials on the protoconch and distinctive spermoviduct easily seen with very little dissection.

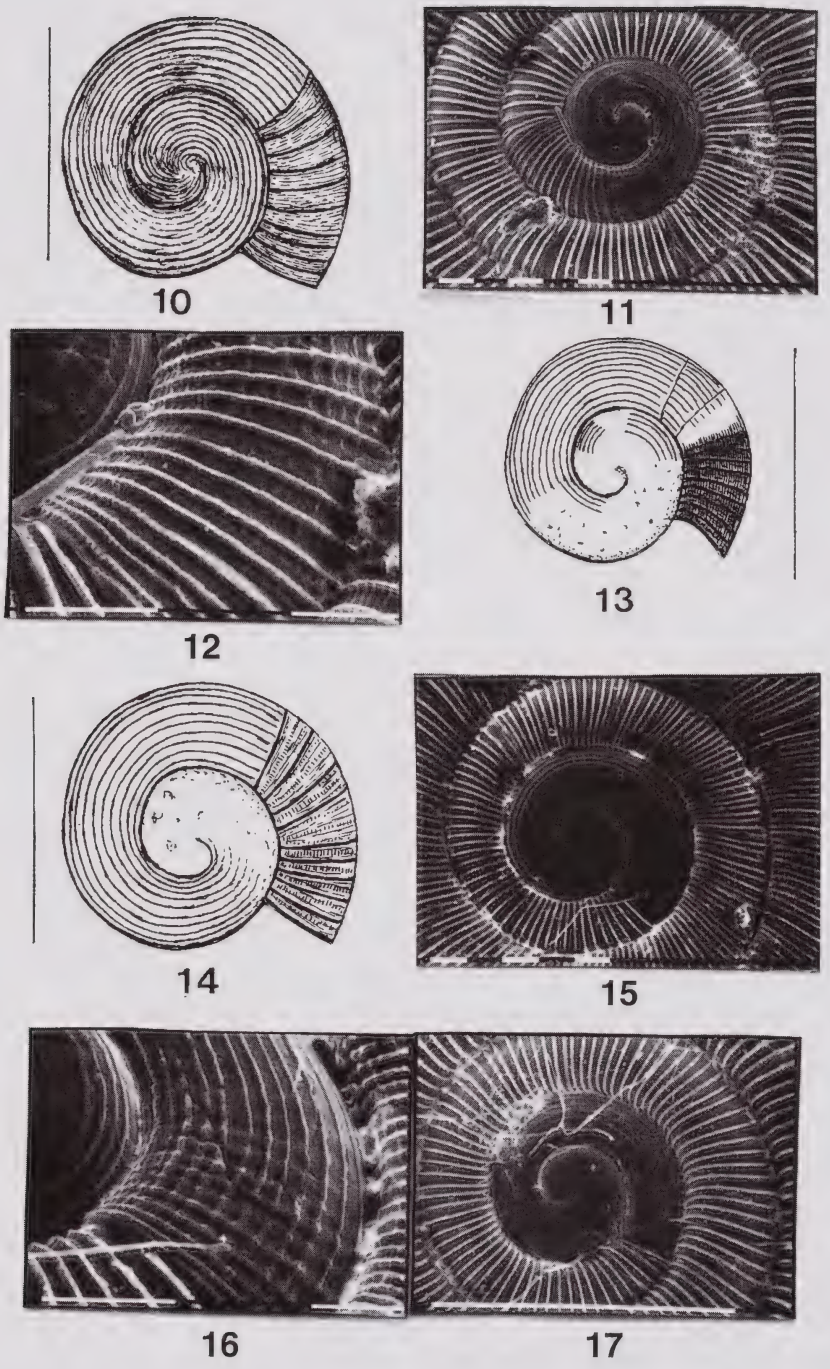
TYPE LOCALITY: Mt. Cook, Hooker Valley.

LECTOTYPE: NMNZ M.125151, 2.65 mm x 1.4 mm.

PARALECTOTYPES: Hooker Valley, NMNZ M.125410 (2); NMNZ M.125411 (1).

OTHER MATERIAL EXAMINED

Chatham Island: Many sites J.F.G. -/2/89, AK95603, AK95606, AK95616, AK95618, AK95650, AK95665, AK95711, AK95729, AK96441, AK96443. **Hawkes Bay**: Tangaio V20 446056, V20 447028, D.J.R. 16/12/94, M.120565-7; Pongaroa, D.J.R. 19/4/70; Napier, Poriate in middens V21, Otago School of Mines, AK95359. **Kaikoura**: Goose Bay O32 531589, J.F.G. 12/2/94, AK96379; Blue Duck Scientific Res., rimu P31 750858, J.F.G. 10/2/94, AK96382; Sawcut Gorge P29 916242, J.F.G. 9/2/94, AK96380. **Lyttelton**: Dyers Pass



Figs 10-17. Protoconch details. Scale line on line drawings = 0.5 mm, on micrographs each division = 0.1 mm. 10. *Climocella maculata* (Suter), Mt. Cook, Governors Bush (AK85035). 11-12. *C. akarana* n. sp., Waiuku (M.69276). 13. *C. cavelliaformis* n. sp., Waiwera (holotype AK72704). 14. *C. haurakiensis* n. sp., The Noises (holotype AK72707). 15-16. *C. kaitaka* n. sp., Mercer (M.69257). 17. *C. rata* n. sp., Hapuakohe Range (M.63494).

M36, H. Suter, AK85034. **Mt. Cook**: Hooker Valley, Governors Bush, A.E. Brookes, AK85035, AK96384. **Otago**: Shag Point, C.R. Laws, AK26427; Dunedin, Grahams Bush I44 222860, J.F.G. 20/1/91, AK96381; Waitati I44, A.W.B. Powell 1927, AK85033; Herbert Forest, kahikatea J42 319487, J.F.G.15/2/94, AK96385. **Wellington**: Te Aro St. R27 577887, D.J.R. 13/12/94, M.120564; Palliser Bay, Turanganui S28, A.C. O'Connor 1/9/46, AK85631.

DISTRIBUTION

The above is not an exhaustive list of museum holdings but establishes the main range of the species and representative areas of particular abundance in eastern and central parts of both islands from Hawkes Bay to Otago plus the Chathams. There is some shell variation within this range and *C. kenepuruensis* Suter needs to be evaluated before a more detailed distribution is established. In this respect the distribution map (Fig. 50) is also an approximation.

Climocella akarana n. sp. Figs 2, 3, 11, 12, 22-27, 50

Charopa (Mocella) eta Climo 1970:314, Powell 1979:310 (in part).
"Mocella" n. sp. aff. *maculata* Solem, Climo & Roscoe 1981:477.
"Mocella" sp. 3 Goulstone 1983:21; 1986:11; 1990:25; 1991:6,9; 1992:21 (in part).
In the Museum of New Zealand collection and among workers it has been designated "northern *maculata*".

ETYMOLOGY: The Maori name for Auckland is *Akarana.*

DESCRIPTION

Shell small, 2.8 mm x 1.5 mm, up to four whorls, subdiscoidal, spire slightly raised in most specimens but apex sunken in a few. Protoconch 1.5 whorls, with 9-10 spiral lirae, crowded near centre, more widely spaced over rest of surface; last third of protoconch with secondary axials starting faintly and very oblique, reticulated by spirals, getting stronger and straighter as teleoconch ribs are reached (Figs 11, 12). Teleoconch with axial ribs, strong at the base with rounded tops, interstices (twice the width of the ribs at widest) with fine radials reticulated by strong microscopic spirals, these crossing the main ribs as well. First teleoconch whorl with about 84 ribs sometimes wider apart at start. Ribs on fourth whorl about 24 per mm. Sutures deep causing prominent shoulder on body whorl. Umbilicus wide, its diameter a quarter to a third of shell width. Colour horny with regular reddish brown axial bands of variable width. These markings seem to vary locally and at some locations the reddish brown bands are bold and sharp.

Proximal section of penis thick, narrowing in the distal section, both parts of equal length. Epiphallus, about same length as total length of penis, entering penis alongside retractor muscle. Epiphallus quite bulbous where vas deferens joins, this feature being easily seen through pallial cavity membranes. Vagina short, free oviduct long, narrow, proximal section folded. Enlarged section of spermathecal duct wider than the oviduct at its origin but very slender towards the receptacle. Oesophagus, flanked by two small salivary glands, leaves the buccal mass level with the distal end of spermoviduct (Fig. 27). Albumen gland, abutting the base of kidney, is caught up in coils of intestine. Spermathecal sac rests against albumen gland at proximal end of spermoviduct. Hermaphroditic duct enters just at base of albumen gland, fine at point of entry but almost immediately thickening for about 0.4 mm. Structure

of the lobes of the two hermaphroditic glands, positioned nearly half way down digestive gland, hard to ascertain but proximal one was always smaller (Figs 24, 26).

REMARKS

Four specimens were dissected; Waikowhai Reserve (1), Clevedon Scenic Reserve (1), Rangitoto (2). This is the commonest and hardiest *Climocella* around Auckland but can look very different at various locations. At the type locality the shells are almost colourless or have very pale markings whereas at Rangitoto they have bright colour markings and tend to grow larger, 2.8 mm was common whereas 2.5 mm was normal at "Ngaheretuku". Obviously the colour-pattern is the main feature of *C. akarana*, for the next in abundance, *C. kaitaka,* has a plain shell. Unfortunately, worn specimens of *C. akarana* exhibit little or no colour-pattern and gerontic specimens can look very like other *Climocella.* Considered over a wider area *C. akarana* looks like *C. maculata* but with closer whorls, sometimes stronger colour-pattern and a wider umbilicus. There is no evidence that *C. maculata* lives near Auckland. Protoconch details for *C. akarana* will be the most useful for separating it as the other colour-patterned species do not have the strong secondary axials. In anatomy, the bulbous end of the epiphallus, squeezing out *in situ* between penis and spermoviduct midway beneath the pallial cavity, is a useful distinguishing feature.

TYPE LOCALITY: R11 898669, Manukau City, Clevedon, Twilight Rd., Royal Forest & Bird Protection Society Reserve, "Ngaheretuku". Under a large kahikatea (*Podocarpus dacrydioides*) growing in the headwaters of a small stream where it was damp and dark.

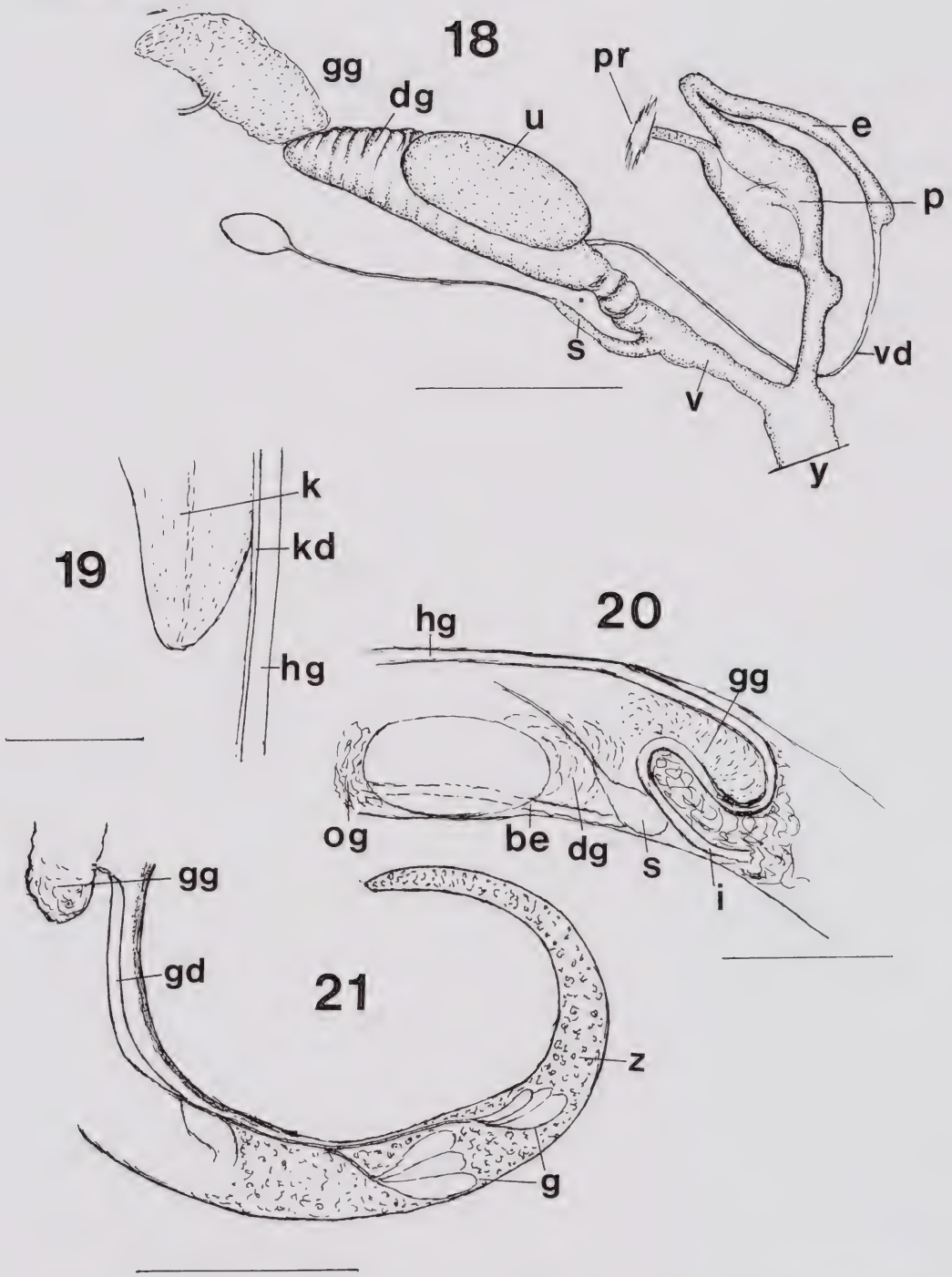
HOLOTYPE: Auckland Museum AK72702, 2.5 mm x 1.25 mm. J.F.G. 1/10/85.

PARATYPES: All from type locality. AK72703 (14) AK72711 (1), J.F.G. 1/10/85. NMNZ M.125006 (15) J.F.G. 1/10/85.

OTHER MATERIAL EXAMINED

Auckland: Mt. Wellington lava field R11, A.W.B. Powell 31/10/26, AK85606, C.A. Fleming, M.30610; Waikowhai R11, 28/2/26, AK85608; Lynfield, G. Kuschel 4/5/75, M.61784; Sylvania Cres., Blockhouse Bay, B.F.H 8/3/94, M.116736, B.F.H. & H. Taylor 4/10/86, M.99479; Mangere Mountain R11 762709, J.F.G. 1976, AK96617; Mangere Oxidation Ponds R11 659674, subfossil, J.F.G. 28/2/92, AK96660. **Auckland North**: Kaipara Pen. Q09, N. Douglas 22/10/72, AK85648; Whangateau Beach, B.F.H. 31/1/87, M.99469; Warkworth, Sandspit, B.F.H. & D.J.R. 25/12/78, M.104376; Okura Walkway R10 631018, J.F.G. 4/2/93, AK85622; between Waimauku & Muriwai, A. Suter, AK85632. **Auckland North Shore**: Birkenhead, Muriel Fisher Res., R11 626865, J.F.G. 16/1/94, AK87681; Tui Glen Bush, B.F.H. M.47755; Kendalls Beach, B.F.H. 1/1/91, M.107794. **Auckland South**: Raventhorpe Sc. Res. R12 848466, J.F.G. 31/7/88 AK85617; Mt. William Sc. Res., S12 904410, J.F.G. 1/4/84, AK96635, B.F.H. 1/10/83, M.78945, B.F.H. 7/10/84, M.80264; Patumahoe, Hunter Res., R12 737443, J.F.G 1/9/85, AK96651; Manukau South Head, W. La Roche, AK85612; Pokeno, Tuakau Rd., 3.6 km from Pokeno P.O. B.F.H., M.68636. **Bowentown**: Heads, Tauranga Archaeological Surv., B. Mc.Fadgen 16/11/84, M.85843. **Coromandel Peninsula**: Port Jackson Sc. Res. S10 202202, J.F.G. 1/1/79, AK96649, AK96748; Port Jackson S10 221195, J.F.G. 1/1/78, AK96650; Moehau, Hope Str. S10 255133, J.F.G. 17/1/82, AK85624; Stony Bay, N. Douglas 6/1/69, AK85611; Colville: 250 m S of

motel T10 309048, D.J.R. 4/9/88, M.101072, T10 308036, 60 m P.M. 1/5/81; Matapaua Bay T10 609919, 10 m, P.M. 1/3/94; Otama Forest Park T10 545912, 80 m, P.M. Waitara Rd. T10 555917, 60 m, P.M. 1/3/94. Korapuki Is. T10 652007, 40 m, P.M. 1/3/94. Stanley Is. T10 683031, 80 m, P.M. 1/3/94. Kauaeranga Valley, Waiwawa Hut T12 452596, AK96663, T12 459542, AK96664, J.F.G. 1/1/79; Whitianga, Mill Ck. T11 473766, J.F.G. 1/3/83, AK96666; Hot Water Beach, P.M. 1/9/77, M.76161; Tairua, Charlottes Farm, P.M. 1/5/81, M.76242; base of Karangahape Bluff, P.M. 1/1/81, M.82100. **Fitzgerald Glade**: Rotorua highway, A.G. Beu, 20/1/61, M.23408. **Great Barrier Island**: R.G. Ordish 23/11/63, M.31008; S08 277636, D. Hunt 1/2/87, M.100242; Whangaparapara S08 257508, AK85600, S09 264501, AK96624, J.F.G. 12/1/81; Port Fitzroy S08 226567, J.F.G. 26/3/90, AK96662; Northern Block S08 269618, J.F.G. 24/3/90, AK96625; Harataonga Sc. Res. T08 308555, J.F.G. 25/3/90, AK96636. **Gulf Islands**: Waiheke S11,G. Sadler, AK95056; Ponui Island, S11 055788, M. Walker 29/11/71, AK96616; Rangitoto, R11 765867, J.F.G. 26/9/76, AK96630, AK96693; The Noises: Motuhoropapa R10 85994, J.F.G. 4/11/94, AK96626, P. Moors 1/4/78, M.57909; Scott Is., G.W. Ramsay 20/8/78, M.73616. **Hamilton**: Boundary Rd., B.F.H. 16/8/77, M.62744; Karapiro T15 426585, 19/10/82, M.73954; Raglan Rd., Forest Res. 8.85 km from Raglan intersection, B.F.H. 30/5/76, M.47765. **Hapuakohe Range**: Te Hoe S13 181110, B.F.H. 7/10/78, M.63527, M.63524, M.63493. **Hunua Ranges**: Whakatiwai Reg. Park S12 116550, J.F.G. 23/1/92, AK85612; Mangatawhiri S12, L. Fitzgerald 12/12/72, AK8604, S12 019531, J.F.G. 1/6/76, AK96086, S12 023531, J.F.G. 1/6/76, AK96620; Duders Bush S11 943738, J.F.G. 11/3/90, AK96087; Clevedon Sc. Res. S11 917665, J.F.G. 19/3/95, AK96586; Hunua Gorge, R12 887563, J.F.G. 1/8/84, AK96633, B.F.H. 3/5/76, M.47873; Mangatangi Dam, S12 067510, J.F.G. 1/12/85, AK96638; Wairoa Gorge S11 949615, J.F.G. 1/10/84, AK96641; Wairoa Dam S12 987528, J.F.G. 1/8/79, AK96643; Te Morehu Res. S11 043682 J.F.G. 1/8/83, AK96653; Cosseys Dam S12 974568, J.F.G. 1/3/83, AK96654; Red Hills Sc. Res. R12 862573, J.F.G. 8/9/86, AK96758. **Kawhia**: Te Kauri Park, B.F.H. 15/8/77, M.69866. Harbour Scenic Res., B.F.H. 15/8/77, M.72276, M.62620; Andersons Bluff, B.F.H. 22/10/77, M.57597. **Matamata**: A.E. Brookes, AK85598. **Ngaruawahia**: C. Broomfield 1977, M.57898; waterworks area, B.F.H. 17/9/77, M.57049. **Port Waikato**: R13, H.J. Finlay, AK85615; Colebaker Res., P.M. 1/4/83, M.87486; Waikaretu, limestone on Mannerings farm, B.F.H. 2/12/77, M.57350, M.58257, M.68569-70, M.72459, M.82007; Limestone Downs R13 645145, N. Douglas 13/2/81, M.77917, F.M.C. & D.J.R. 13/2/81, M.77949, Junior Naturalists Club 1972-73, M.45944. **Raglan**: Te Toto Gorge R14, 666717, J.F.G. 1/1/84, AK96665; cave talus, Karamu, Hamilton Junior Naturalists Club, per S. Easterbrook-Smith 1970-72, M.45668; Cogswell Rd., 7 km towards Raglan from Raglan deviation, P.M. 1/1/78, M.61985. **Waitakere Ranges**: Huia Ridge track, rimu Q11 452687, J.F.G. 1/10/82, AK 96717; Fairy Falls track Q11 492756, J.F.G. 1/9/82, AK96640; Titirangi R11 581720, J.F.G. 1/1/82, AK96655, B.F.H. 29/5/76, M.48553; Bethells, Q11 447807, J.F.G. 1/2/82, AK96656; Cornwallis, 20/5/27, AK85629; Huia Dam Q11 484695, J.F.G. 11/12/90, AK96657, AK96719; Piha Rd., Q11 453700, J.F.G. 18/9/82, AK96658; Walkers Bush, B.F.H. 5/10/78, M.63423, 26/10/83, M.75324, M.63443, M.75860; Whatipu, lookout rock on road Q11 462626, AK96659; Te Henga, P.M. 1/1/80, M.99264; Muriwai, Maori Pah Q11, AK85621 Dell collection, M.25383, M.84738; Spraggs Bush, B.F.H. 26/10/83, M.80308. **Waitomo**: Stubbs farm, B.F.H. 16/11/77, M.70505, 2/7/78, M.70157, M.61514. **Waiuku**: coastal flax, B.F.H. 14/1/78, M.69276; Harveys Bush, F.M.C. 15/2/81, M.82300; Waipipi Sc. Res. R12 580412, J.F.G. 1/1/76, AK96632, B.F.H. 3/1/77, M.51799, M.57662, F.M.C. & D.J.R. 12/2/81, M.78572, M.78552. Further material is held in bulk collections in the Auckland Museum.



Figs 18-21. Anatomy of *Climocella maculata* (Suter), Hawkes Bay, Pongaroa, D.J. Roscoe 19/4/70, shell width 2.7 mm. Scale lines = 1 mm. Abbreviations: b - buccal mass, be - oesophagus, dg - hermaphroditic gland, e - epiphallus, g - hermaphroditic gland, gd - hermaphroditic duct, gg - albumen gland, gt - talon, h - heart, hg - hindgut, i - intestine, iz - stomach, k - kidney, kd - ureter, mc - mantle collar, og - salivary glands, od - salivary gland ducts, p - penis, pi - black pigmentation, pr - penis retractor muscle, s - spermathecal shaft and its sac, u - spermoviduct, uv - free oviduct, v - vagina, vd - vas deferens, vrm - vagina retractor muscle, y - genital atrium, z - digestive gland. 18. Reproductive system. 19. Kidney. 20. Section of body between buccal mass and stomach. 21. Hermaphroditic glands and duct.

DISTRIBUTION AND HABITAT

In a survey of over 100 native species found in South Auckland (Goulstone 1990) *C. akarana* was found at 57 sites out of 141 sampled. The sites were grouped according to four degrees of modification. In the first category, the Hunua Ranges Water Catchment Area, least modified, *C. akarana* was found at 18 out of 34 sites. In the most modified category, small pieces of bush around Auckland, Manukau City and Franklin, *C. akarana* scored 12 out of 29 sites and it was the tenth most widespread native species in the area. On Rangitoto and in the deep crater of Mangere Mountain they live in dry scoria rocks with little overhead cover. They are also common in the Waitakeres (Goulstone 1983) and were found at 37 sites in a total of 86. The Coromandel Ranges had them at 19 out of a total of 57 sites (Goulstone unpubl.) and Great Barrier Island 9 sites out of 49 (Goulstone 1991). It is almost certainly a ground litter dweller and is particularly abundant in the West Coast limestone areas from Waitomo through Kawhia and Raglan to Port Waikato.

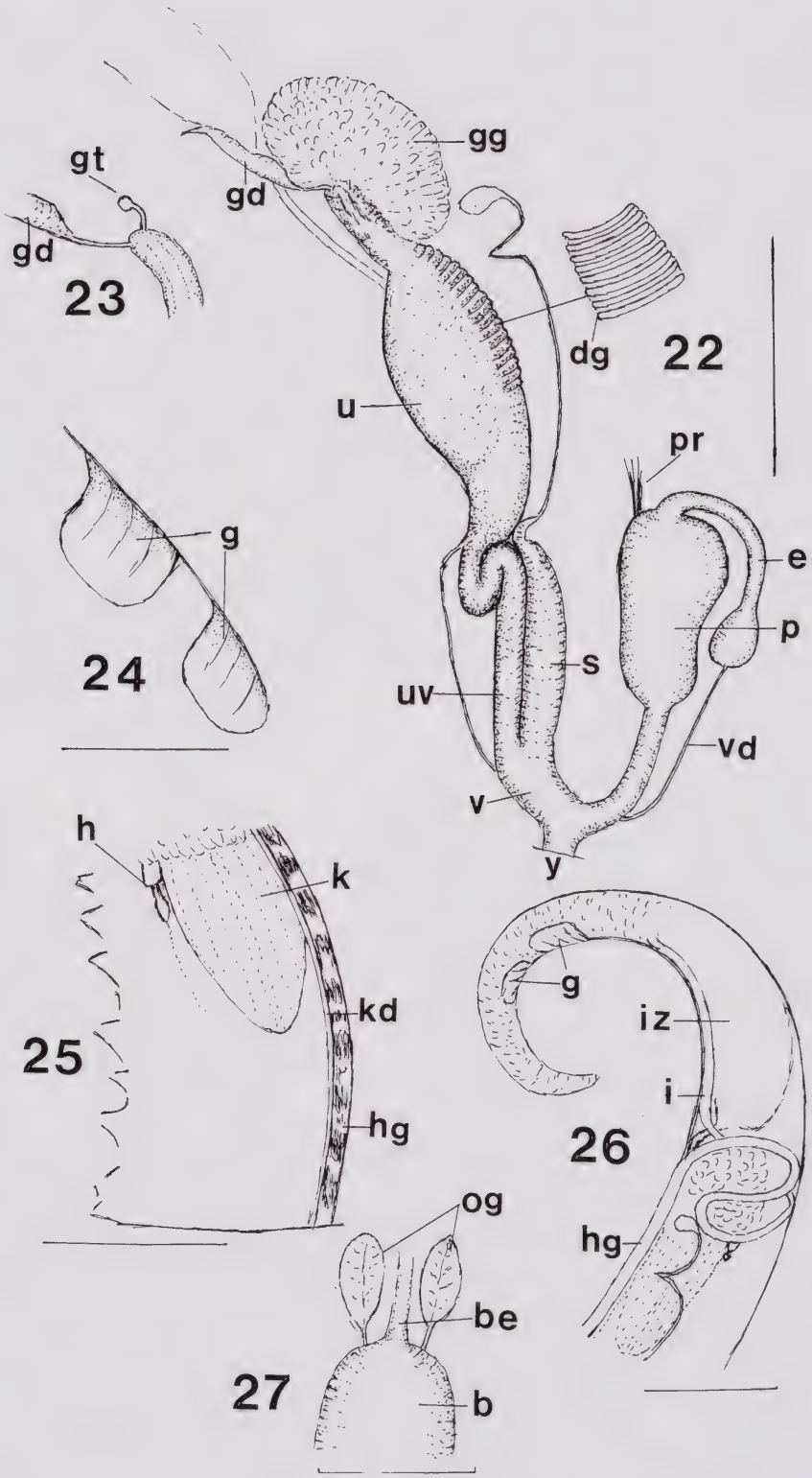
***Climocella cavelliaformis* n. sp. Figs 4, 13, 28-32, 50**

ETYMOLOGY:This species has axial ribs with some similarity to the genus *Cavellia* which has ribs growing strongly forward from the suture in the direction of shell growth forming a definite sinus at the aperture.

DESCRIPTION

Shell small, up to 2.8 mm x 1.5 mm, four whorls slightly compressed (compared with *C. akarana*), subdiscoidal, spire flat but last whorl dropping a little. Sutures deep. Protoconch, 1.25 whorls with 9-10 spiral lirae crossed by two weak oblique axials on last section (Fig. 13). Teleoconch with axial ribs stout at the base with moderately sharp apex, interstices with a number of very fine axials reticulated by strong microscopic spirals which climb fairly well up the main ribs and over them where they are rounded near the sutures. First teleoconch whorl has approx. 68 radial ribs and final whorl about 21 per mm. Space between ribs at widest is up to twice width of the ribs. Ribs sinuous when they leave suture but from shoulder arc forward in the direction of growth to produce a shallow sinus at aperture. Umbilicus of medium width, its diameter one quarter to one third of total shell width. Most shells have a weak colour-pattern of blotchy reddish brown radials on a horn background, the markings more prominent on the last whorl.

Animal white with a little white stringy pigmentation over stomach area. Proximal end of penis short and thick opening into a longer narrow tube at the distal end. External epiphallus about total penis length with a very small swelling at its junction with the vas deferens. Vas deferens a substantial tube which for much of its length lies against the long narrow oviduct. Spermathecal duct twice diameter of oviduct at its origin reducing to a slender tube on a level with the distal end of the spermoviduct. Free oviduct and vagina, spermathecal duct, vas deferens, epiphallus and penis are held as a tight bundle of tubes in the retracted state, difficult to separate. Salivary glands, very long and delicate, are squashed into a space at end of the buccal mass between penis and distal section of spermoviduct (Fig. 29). Spermoviduct about a third the length of penis. Rear heart chamber is spherical and prominent below kidney, between spermathecal sac and albumen gland (Fig. 32). Hermaphroditic duct has straight swollen section about 1 mm long just before its entry to base of albumen gland, and two lobes of the hermaphroditic gland close to stomach nearly fill a cross section of digestive gland (Fig. 31). Pericardial lobe of kidney prominent, rectal lobe reduced.



Figs 22-27. Anatomy of *Climocella akarana* n. sp. Scale lines 22, 25, 26 = 1 mm; 24, 27 = 0.5 mm. Abbreviations as for Figs 18-21. 22. Reproductive system. 23. Talon greatly magnified. 24 Hermaphroditic glands. 25. Kidney. 26. Posterior section of body. 27. Salivary glands.

REMARKS

Two specimens were dissected, one from Blomfields Bush (A.W.B. Powell 1968) and one from Waiwera (J.F.G. 1995). This species most closely resembles *C. akarana* though on shell details it can readily be separated for it is tighter coiled with different protoconch detail and distinctive ribs. The ribs nowhere approach the obliqueness of a *Cavellia* and do not leave the suture at a strong angle forming a deep sinus at the aperture as in that genus. However, they show this tendency and it separates them from other species of *Climocella*. Climo (1970) in his description of the subgenus *"Mocella"* stated "there is no developement of an apertural sinus", but I do not think he had seen specimens of *C. cavelliaformis* at the time. The round heart chamber, comparatively large resting against the albumen gland, is a prominent feature of the animal.

TYPE LOCALITY: North of Auckland City, just north of Waiwera, half way down the hill before the Puhoi turnoff. Regenerating forest with many cabbage trees (*Cordyline australis*) and nikaus (*Rhopalostylus sapida*) on a steep northerly slope R10 608172.

HOLOTYPE: Auckland Museum, AK72704, 2.75 mm x 1.4 mm, B.F.H. 4/6/90.

PARATYPES: All from type locality. AK72705 (5) B.F.H. 4/6/90, AK72706 (1) whole organism, J.F.G. 14/4/95; NMNZ M.125007 (5) J.F.G. 14/4/95; NMNZ M.120552 (1), NMNZ M.120553 (2), B.F.H 14/4/95.

OTHER MATERIAL EXAMINED

Hunua Ranges: Mataitai State Forest S11 655997, L. Uangakore 1/12/89, AK96619; Moumoukai Hill Rd., puriri S11 009630, J.F.G. 1/10/83, AK96747. **Kawau Island**: P. M. 1/8/83, M.87611. **North Shore**: Okura River, Blomfields Bush R10, A.W.B. Powell 3/5/68, AK85625, 29/2/68, whole organism AK81378; Okura walkway, Haig access Rd. R11 631018, B.F.H. 15/10/94, M.120562, M.120561, M.120560, J.F.G 4/2/93, AK85622; 2.5 miles S of Pukapuka Rd., P.R. Jamieson 30/12/74, M.88647; Waiwera, Puhoi Hill, R10, A.W.B. Powell 5/3/47, AK85633; Waiwera Scenic Res., nikau R10 633153, B.F.H. 30/4/94, M.120563. **Waitakere Ranges**: Huia, Q11, L. Fitzgerald 5/3/72, AK85031. **Warkworth**: Dome Valley R09 565355, D.J.R. 2/1/78, M.104399.

DISTRIBUTION AND HABITAT

Climocella cavelliaformis has not been frequently collected but at the type locality they have a definite preference for nikau, indeed all the live specimens were taken from nikau fronds on the ground. No surveys have been carried out to ascertain whether there is a correlation between populations on the living tree and populations in the fallen fronds but in my experience there is not, in which case *C. cavelliaformis* should be considered a ground dweller with a preference for rotting nikau fronds. On present evidence its range is restricted and it is only abundant in one reserve at Waiwera.

Climocella haurakiensis n. sp. Figs 5, 14, 33-39, 50

Charopa (Mocella) eta (Pfeiffer), Climo 1970:314; Powell 1979:310 (in part).
"*Mocella*" sp. 3 , Goulstone 1986:11 (in part).
"*Mocella*" sp. 1 , Goulstone 1983:20; 1990:25; 1991:6,9 (all in part).

ETYMOLOGY: The Hauraki Gulf, its islands and margins, seems to cover the range of this snail.

DESCRIPTION

Shell small, up to 3.5 mm x 2.1 mm, subdiscoidal, spire flat or a little raised, 4.5 whorls, last whorl slightly accelerated and dropping. Protoconch of 1.25 whorls with 9-10 spiral lirae (Fig. 14). Teleoconch whorls with axial ribs, moderately flexuous and strong, emerging at right angles from sutures which are deep but becoming a little protractive past the shoulder. Interstices, about twice width of ribs at most, have fine axials reticulated by close spiral lirae of similar strength which also cross the primary ribs. First teleoconch whorl has approx. 67 ribs, first few near protoconch somewhat wider apart. Final whorl has about 26 ribs per mm. Diameter of umbilicus one quarter of total shell width. Shells unicoloured, horny to light brown, juvenile specimens have a hint of radial colour bands on the first whorl. At type locality most shells were coated in black from the litter.

Animal with large buccal mass and salivary glands but small reproductive organs. No external epiphallus,vas deferens entering penis well below its apex. Penis a simple tube with retractor muscle at apex, bent at vas deferens entry about a third of way down from apex, joining vagina distally a short distance from atrium. Vagina, about same length as penis, stretches around buccal mass, and is sausage-shaped with one side attached to retractor muscle. Free oviduct short and narrow, closely circling the buccal mass to join the spermoviduct. Entry to spermathecal duct about same width as oviduct and about half the length, before it reduces to a slender tube leading to the receptacle. Spermoviduct is flattish, featureless, wide at the bottom where attached to buccal mass and tapering to apex where it joins albumen gland. Vas deferens, relatively short joins spermoviduct opposite oviduct, close to atrium, completing an encircling of buccal mass by genitalia. Albumen gland engulfed in large salivary glands as is small spermathecal sac. Hermaphroditic duct very fine and hermaphroditic gland a fine featherlike organ on columellar wall of digestive gland (Fig. 38). One of dissected animals had a sperm packet lodged in spermathecal duct. It was small, cigar shaped, glistening, and crystalline white.

REMARKS

Eight snails from Motuhoropapa Island, the Noises Group, were dissected. This animal seems different from *Climocella,* yet the shell is so similar to that of other *Climocella* I have decided to leave it with the group until its true affinities can be ascertained. Strangely this is the hardest species to identify as it looks like a *C. rata* without colour and has a similar protoconch detail. It is larger though, and inclined to be domed, whereas *C. rata* is flattish and the apex often slightly sunken. The ribs on the teleoconch of *C. haurakiensis* are slightly taller and sharper with the microscopic spirals not so pronounced.

TYPE LOCALITY: The Noises, Otata Island, Hauraki Gulf, R10 870988.

HOLOTYPE: Auckland Museum AK72707, 3.45 mm x 2.1 mm, G. Sadler.

PARATYPES: AK72708 (2), type locality, G. Sadler. AK72712 (6) Motuhoropapa Is. R10 859994, J.F.G. 4/11/94. NMNZ M.125008 (3), type locality, G. Sadler; NMNZ M.73918 (5), NMNZ M.73764 (1) Motuhoropapa R10 859994, D.W. Helmore & J.M. Cleary 17/12/78.

OTHER MATERIAL EXAMINED

Coromandel Ranges: Port Jackson, Pahi Ck. S10 221195, J.F.G. 1/12/78, AK96746; Port Jackson Sc. Res. S10 202202, J.F.G. 1/1/78, AK96721. **Great Barrier Island**: Port Fitzroy S08, A.E. Brookes, AK85682. **Hunua Ranges**: Waharau Regional Park under rata S1125600, J.F.G. 1/10/83, AK96621. **Motutapu Island**: middens, R. Nichol 1983, M.80035; under Rangitoto ash, B. McFadgen 13/11/74, M.47354. **Noises Islands**: Motuhoropapa in insect traps between 3/11/77 & 27/2/79, D.W. Helmore & J.M. Cleary, M.73708; L.L. Deitz, M.73736, M.73762; J.S. Dugdale, M.73731, M.73831; B.M. May, M.73902; J.C. Watt, M.73830; J.M. Cleary & M.F. Tocker, M.73908; D.W. Helmore, M.73926. **North Shore**: Le Roys Bush R11 652862, J.F.G. 26/12/90, AK85050. **Rangitoto Island**: A. Suter 31/7/32, AK85051; A.W.B. Powell 1/4/27, AK85049; Boulder Bay, P. Parkinson 1/6/69, M.37569; Rangitoto wharf R11 765867, J.F.G. 26/9/76, AK96629; 6/4/95, AK96694. **Waiheke Island**: between Oneroa and Palm Beach S11, 1/1/33, AK85657.

DISTRIBUTION AND HABITAT

This species favours the Hauraki Gulf Islands where it is easy to find though never abundant. On the Noises it was found living in the litter and specimens were particularly dirty. The large buccal mass and well developed salivary glands of this species is suggestive of a carnivorous habit (G. Barker pers. comm.). It appears at the moment to be confined to some islands in the Hauraki Gulf with some mainland locations around the edge. An archaeological excavation on Motutapu Island discovered 30 subfossil shells and this appears to have been its area of greatest abundance. Pitfall traps on Motuhoropapa Island in 1977-78 yielded several specimens, mostly juveniles. The snails may have crawled in, attracted by the dead insects.

Climocella kaitaka n. sp. Figs 6, 7, 15, 16, 40-42, 50

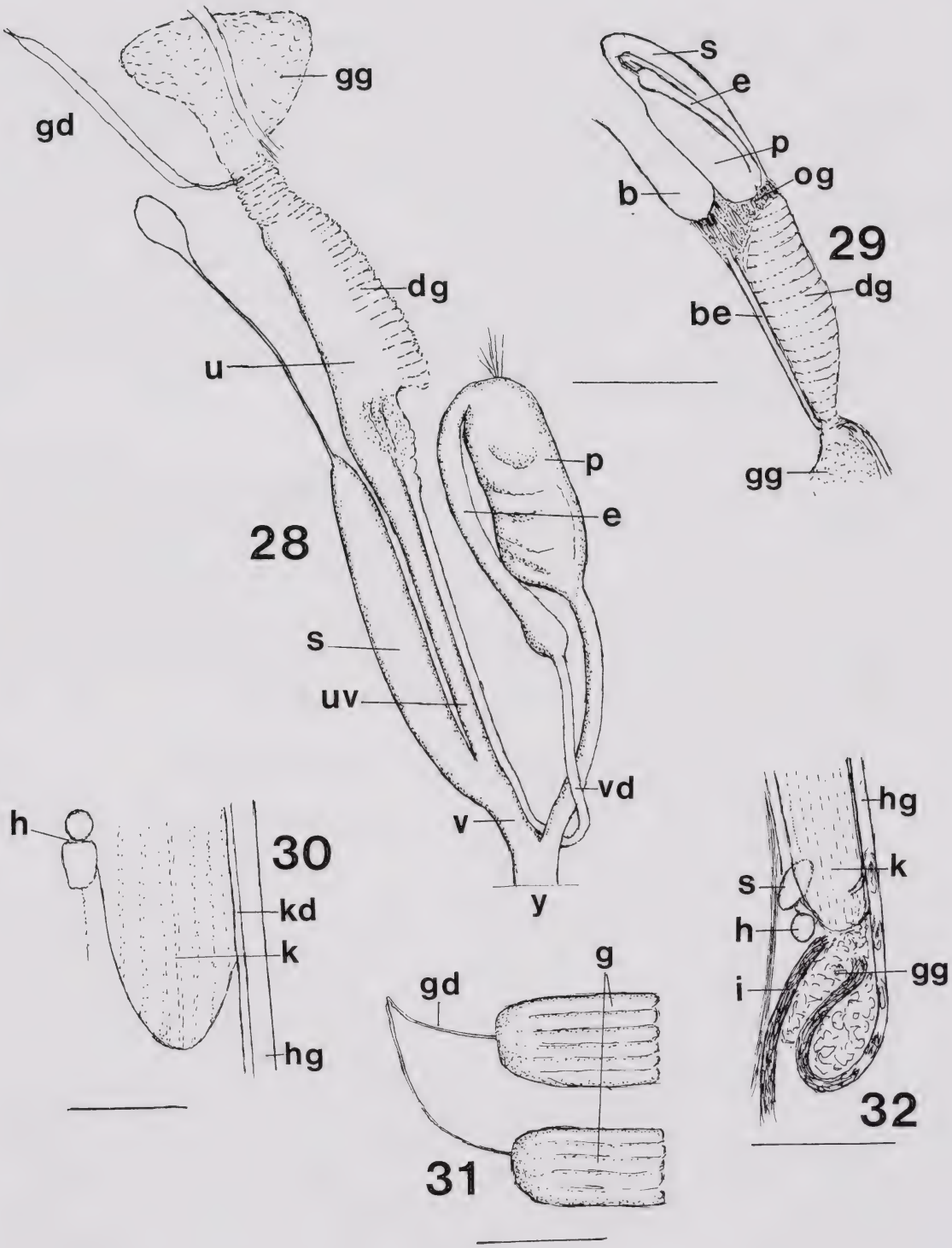
Charopa (Mocella) eta (Pfeiffer) Climo 1970:314; Powell 1979:310 (in part).
"Mocella" n. sp. aff. *manawatawhia* Solem, Climo & Roscoe 1981:477.
"Mocella" sp. 4 Goulstone 1983:21; 1990:25.

ETYMOLOGY: Derived from Maori, *kaitaka* is a fine cloak.

DESCRIPTION

Shell small, up to 2.8 mm x 1.4 mm, unicoloured, four whorls the last somewhat expanded, discoidal, spire flat or slightly depressed. Protoconch of 1.25 whorls with 9-10 spiral lirae which in the last quarter whorl are reticulated by up to 12 faint oblique radials (Figs 15, 16). Teleoconch with close axial ribs reticulated by strong microscopic spiral lirae. Interstices about one rib width with no discernible secondary axials but dominated by the spirals. First teleoconch whorl with about 105 axials, final whorl with 34 per mm. Ribs flexuous coming out of moderately deep suture and slightly protractive past the shoulder. Diameter of umbilicus a quarter to a third of maximum shell width. Colour, straw to white.

Animal with some stringy white pigmentation over stomach otherwise plain. Proximal section of penis a large lozenge-shaped compartment, reducing to a narrow tube in the distal section but widening briefly before it joins the vagina. Epiphallus of similar length to proximal section of penis which it enters at apex alongside retractor muscle.When animal retracted



Figs 28-32. Anatomy of *Climocella cavelliaformis* n. sp. Scale lines 28, 29, 32 = 0.5 mm; 30, 31 = 1 mm. Abbreviations as for Figs 18-21. 28. Reproductive system. 29. Part of reproductive system and buccal mass *in situ*. 30. Kidney. 31. Hermaphroditic gland. 32. Position of heart.

this whole complex lies like a squashed inverted "s" with proximal end of penis facing atrium. Vagina short leading to a wide oviduct about 1 mm long by 0.5 mm wide. Spermathecal duct about half oviduct width and a little longer before it reduces to the slender tube which is short (less than the length of the thickened section) and straight leading to the comparatively large receptacle (0.5 mm) which rests on proximal end of spermoviduct. Hermaphroditic glands (Fig. 42) are substantial organs filling much of cross section of digestive gland and a lower thickened section of its duct is long (1.25 mm) and straight. Kidney with two lobes of equal size (Fig. 41).

REMARKS

Dissections based on two animals from the type locality. In Auckland this snail will readily be identified on its close fine ribbing and secondary radials on the protoconch but in the central North Island identification may not be so easy as there is a very similar looking snail assignable to *Climocella* without the fine secodary radials on the protoconch (Mayhill 1994:51). A specimen from Mercer (Figs 15, 16) had these secondary radials somewhat reduced. Both *C. manawatawhia* and the unnamed species from Te Paki (Goulstone *et al.* 1993) also have a similar shell but the former has a very complex penial structure (Climo 1973) and both seem restricted in range. At the type locality *C. kaitaka* lives in the same space as *C.akarana* and they are easily separated. In the damp, gloomy conditions which prevail here the shells of *C. kaitaka* are pale and delicate with an expanded final whorl. Shells from less protected areas, and limestone populations such as at Kawhia where they are abundant, have a final whorl which is narrower. In these less protected sites the shell and ribs are more robust and it can be harder to identify. In such conditions the shell is mostly white. In a fossil deposit at Mangere the shells appear larger and protoconchs seem to lack those secondary oblique radials.

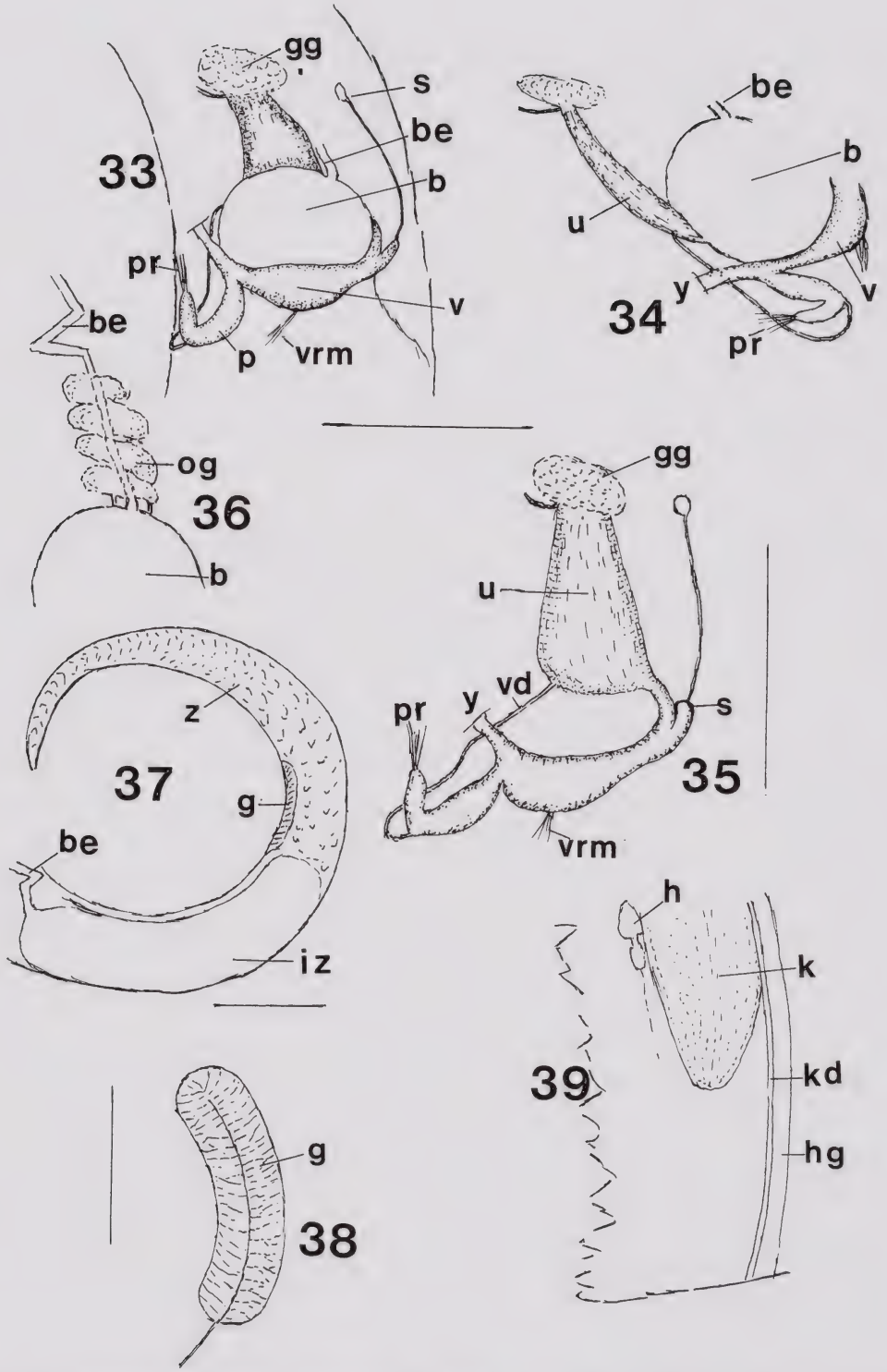
TYPE LOCALITY: Manukau City, Clevedon, Twilight Rd., Royal Forest and Bird Protection Society Reserve, "Ngaheretuku", under a large kahikatea. R11 898669.

HOLOTYPE: Auckland Museum AK72709, 2.65 mm x 1.45 mm, J.F.G. 1/10/85.

PARATYPES: All from type locality. AK72710 (8), J.F.G. 1/10/85. NMNZ M.125009 (8) J.F.G. 1/12/94.

OTHER MATERIAL EXAMINED

Auckland: Mt. Wellington lava fields R11, A.W.B. Powell 31/10/26, AK85664; Mt. Wellington crater, B.F.H. 14/3/87, M.99539; East Tamaki archaeological excav., Regional Arch. Unit 29/10/87, M.97451; Mangere Mountain R11 762709, J.F.G. 1976, AK96618; Rangitoto Is. R11 765867, J.F.G. 26/9/76, AK96631; Mangere Oxidation Ponds R11664673, J.F.G. 6/2/95, AK96743. **Auckland North**: Brynderwyn, P.M. 1/9/84, M.82808; Dome Valley R09 552363, J.F.G. 5/9/82, AK85654. **Auckland South**: Patumahoe, Hunter Res. R12 737443, J.F.G. 1/9/95, AK96652; Papakura, Maketu Pa R12 869497, J.F.G. 8/10/88, AK96726; Red Hills, Gibbs Cres. R12 862573, J.F.G. 8/9/86, AK85658; Red Hills Sc. Res. R12 865571, J.F.G. 7/9/86, AK85665; Raventhorpe Sc. Res. R12 848466, J.F.G. 31/7/88, AK85659; Bombay, Mt. William Res. S12 904409, J.F.G.1/5/84, AK96736, B.F.H. 1/10/83, M.78946; Omana Regional Park S11 911783, J.F.G. 1/2/85, AK96738. **Coromandel Peninsula**: Mill



Figs 33-39. Anatomy of *Climocella haurakiensis.* Scale lines 33, 34, 35, 36, 38 = 0.5 mm; 37, 39 = 1 mm. Abbreviations as for Figs 18-21. 33. Reproductive system, top view *in situ*. 34. Reproductive system, side view *in situ*. 35. Reproductive system. 36. Salivary gland. 37. Position of hermaphroditic gland. 38. Hermaphroditic gland. 39. Kidney.

Creek T11 473766, J.F.G. 1/3/83, AK96739; Kauri Grove Track, kahikatea T11 382812, J.F.G. 1/1/78, AK96744; Matapaua Bay T10 609019, 10 m, P.M. 1/3/94; Hot Water Beach T11 618754, 25 m, P.M. 1/5/81. **Gulf Islands**: Waiheke S11, G. Sadler, AK95055; between Oneroa & Palm Beach, Waiheke S11, 1/1/33, AK96691; Little Barrier S08, A.E. Brookes, AK85652. **Hunua Ranges**: Duders Bush S11 943738, J.F.G. 11/3/90, AK96088; Whakatiwai, Workmans Track S12 542133, J.F.G. 23/1/92, AK96622; Hunua Gorge R12 887563, J.F.G. 1/8/84, AK96634; Mangatangi, rimu S12067510, J.F.G. 1/12/85, AK96637; Patumahoe, Hunter Res. R12 737443, J.F.G.1/9/95, AK96652; Wairoa Dam S12 987528, J.F.G. 1/8/79, AK96727; Mangatawhiri Dam S12 019523, J.F.G. 1/9/76, AK96728; 0.4 km S of Orere Pt. turnoff S11 088665, D.J.R. 1/1/79, M.103681; Waharau Regional Res., rata S12 125600, J.F.G. 1/10/83, AK96734; Cosseys Dam, rimu S12 974568, J.F.G.1/3/83, AK96735; Wairoa Gorge, kahikatea S11 949615, J.F.G. 1/10/84, AK96737; Moumoukai Hill Rd., puriri S11 009630, J.F.G 1/10/83, AK96740; Moumoukai - Waharau Track, rimu S11 013623, J.F.G.2/11/86, AK85646; Mataitai State Forest S11652998, J.F.G. 1/1/90, AK96741. **Kawhia**: Kawaka Ridge, K. Brown 1/10/77, M.81852; limestone ledges E of Andersons Bluff, B.F.H. 22/10/77, M.57425; cave entrance, Andersons Bluff, B.F.H. 22/10/77, M.57596. **Mercury Islands**: Middle Is., A. Ballance 6/10/84, M.81598. Green Is. T10 650023, 5 m, P.M. 1/3/94; Stanley Is. T10 683031, 80 m, P.M. 1/3/94. **Mercer**: just N alongside the railway line, B.F.H. 24/9/78, M.69257. **Ngaruawahia**: Hakarimata Track, B.F.H. 30/1/78, M.72387. **North Shore**: Muriel Fisher Res. R11 626865, rimu, J.F.G. 16/1/94, AK87680. **Port Waikato**: R13, H.J. Finlay, AK85655; Limestone Downs Station, N.Douglas 13/2/81, M.77916; Waikaretu, Mannerings Farm, B.F.H. 17/12/77, M.68429, M.58258; a variety of sites, Hamilton Junior Naturalists Club 1970-73 per S. Easterbrook-Smith, M.45846. **Raglan**: Karioi Peak, B.F.H. 4/1/77, M.55220. **Waitakere Ranges**: Huia Q11, L. Fitzgerald 5/3/72, AK85680; Cascades, 22/9/67, M.32917; Fairy Falls Q11 492756, J.F.G. 1/9/82, AK96729 Kakamatua, macrocarpa R11 518617, J.F.G. 1/7/82, AK96730; Woodlands, F.M.C. 22/9/67, M.37113; Titirangi, Atkinson Res. R11 581716, AK96731; Huia Dam, rimu Q11 484695, J.F.G. 1/1/83, AK96732; Whatipu consolidated dunes, R.K. Dell, M.25034; Korekore Pa Hill, Muriwai Q11, A.W.B. Powell 1925, AK85649. **Waiuku**: R12, Rev. W.H. Webster, AK85656; Waipipi Sc. Res., P.R. Jamieson 24/1/75, M.88506 Harveys Bush, F.M.C. & N. Douglas 15/2/81, M.82419; Crispes Bush, B.F Elliott M.88631, F.M.C. & D.J.R. 16/2/81, M.45798, M.45890, M.77808.

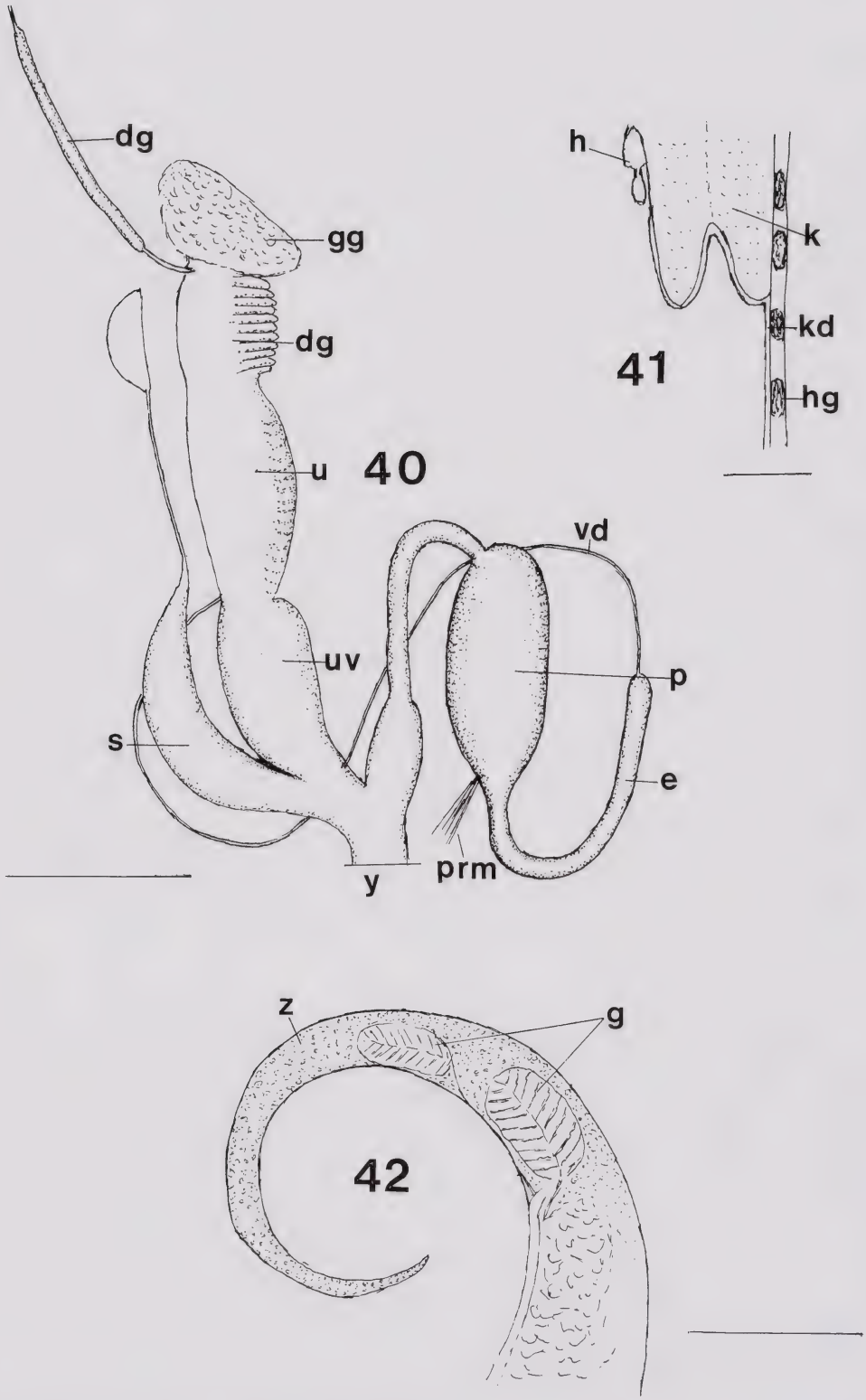
DISTRIBUTION AND HABITAT

C. kaitaka is not prominent on Great Barrier Island or the Coromandel Peninsula but is common on the Auckland Isthmus. In a list of species arranged in descending frequency of occurrence in South Auckland (Goulstone 1990) it was 15th out of more than a hundred, not far below *C. akarana*. It shows no particular preference for an undisturbed situation, but is particularly abundant in the West Coast limestone from Waitomo to Port Waikato. *C. kaitaka* seems at home in a wide range of habitat from very moist (type locality) to very dry (scoria craters of Mangere Mountain and Mt. Wellington). At many locations *C. kaitaka* and *C. akarana* are sympatric.

Climocella rata n. sp. Figs 8, 9, 17, 43-49, 50

"Mocella" sp. 1 Goulstone 1983:20; 1990:25; 1991:6,9 (in part).

ETYMOLOGY: Northern rata *Metrosideros robusta* is a prominent tree at the type locality.



Figs 40-42. Anatomy of *Climocella kaitaka* n. sp. Scale line = 1 mm. Abbreviations as for Figs 18-21. 40. Reproductive system. 41. Kidney. 42. Hermaphroditic gland.

DESCRIPTION

Shell small, up to 3 mm x 1.8 mm, with 3.75 whorls, subdiscoidal, spire flat, in side view outline somewhat squarish. Protoconch, 1.5 whorls with 9-10 spiral lirae cutting off sharply at teleoconch (Fig. 17). Teleoconch with primary axials strongly based, slightly sinuous, fairly sharp at their apex. Interstices, twice at most the width of the ribs, with finer radials reticulated by prominent fine spiral lirae (these spirals also going over major ribs), very noticeable near suture. First teleoconch whorl with 75 axial ribs and last whorl has 22 per mm. Diameter of umbilicus one quarter of maximum shell width. Colour consisting of broad indistinct brown bands on a light brown background, more obvious on final whorl. Juveniles display only indistinct dark blotches on a light brown background and definite colour bands seem restricted to final whorl of an adult shell.

Animal distinguished by a broad area of black pigmentation starting at mantle collar and extending nearly to tip of kidney then reducing towards the hindgut (Fig. 47). This pigmentation bisected by pulmonary artery. Penis consisting of a thickened proximal section and a shorter, narrower distal section. Epiphallus, about two-thirds length of penis, bulbous where vas deferens joins, entering penis apically close to retractor muscle. Vas deferens a reasonably substantial tube. Vagina short and bulbous. Free oviduct about same length as thick proximal section of penis. Spermathecal duct at point of origin with vagina about same width as oviduct but it reduces in a short distance to a thick tube, then a very slender one about level with the distal end of the spermoviduct. Spermoviduct in a mature snail is large round thin walled and clear, with prostatic gland around the edge. In a young adult, presumably before ovulation (Figs 48, 49) spermoviduct collapsed into a thin envelope with prostatic gland along thickened edge. Albumen gland in older snail cigar shaped and bent back onto spermoviduct. Thickened portion of hermaphroditic duct long (about half length of total duct) thicker at distal end and tapering at the proximal. Hermaphroditic glands with two uneven separate segments, which are themselves composed of fused segments (Fig. 46). Two long salivary glands wrapped around first portion of oesophagus (Fig. 45). Kidney bilobed, rectal lobe reduced.

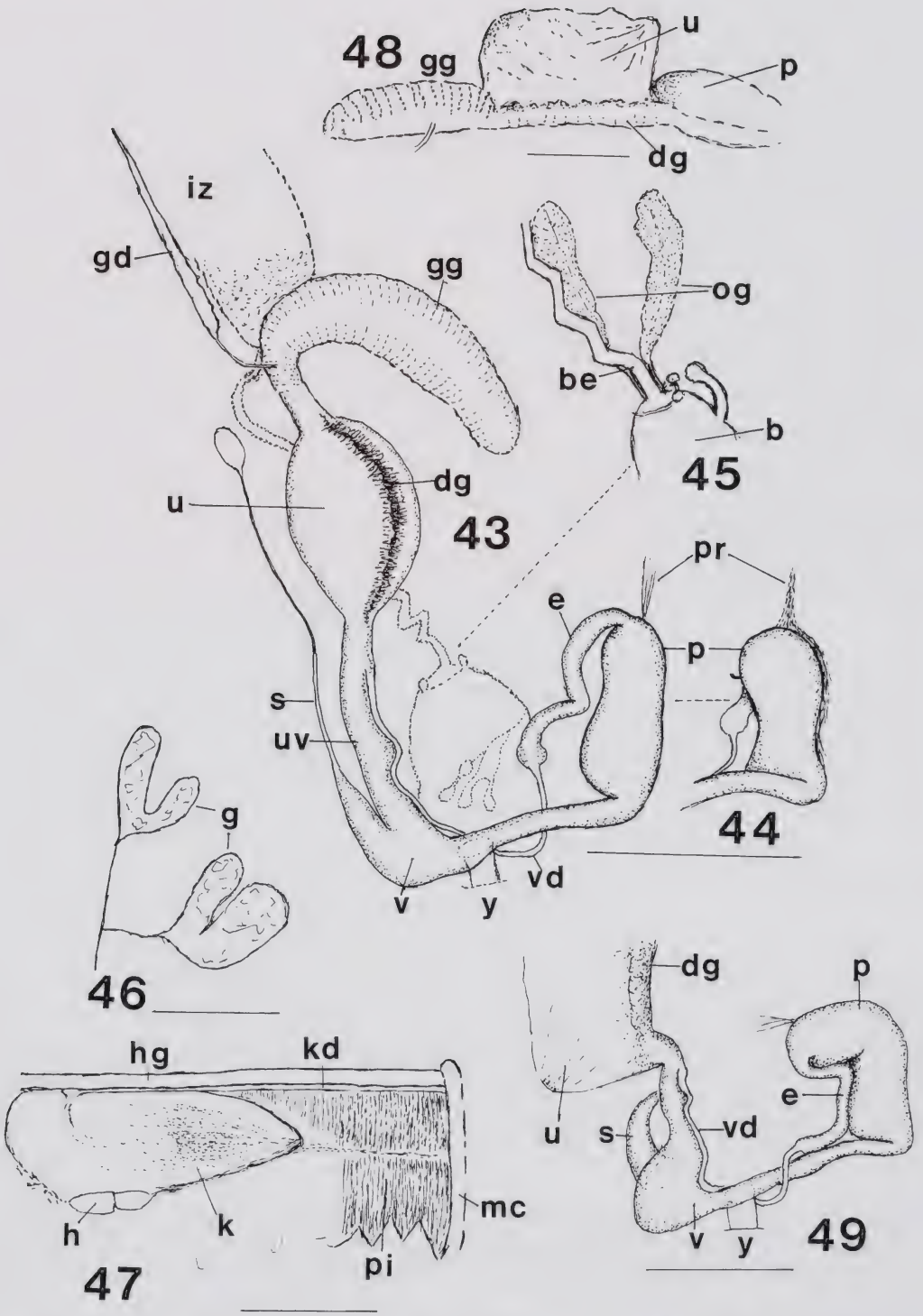
REMARKS

Dissections based on three specimens from the type locality. *C. rata* and *C. haurakiensis* are difficult to separate on shell details yet the anatomy of the animals are remarkably different. In shell characters colour is the most obvious difference but shape can also help in separation of the two species. *C. rata* has a shell with a flat to slightly depressed spire whereas in *C. haurakiensis* it is flat to slightly raised. Black pigmentation on the roof of the pallial cavity also defines *C. rata*. The shape and texture of the spermoviduct of *C. rata* suggests a link to *C. maculata* as does the structure of the hermaphroditic gland and the blotchy colour-pattern of the shell.

TYPE LOCALITY: Hunua Ranges, Whakatiwai Regional Park, the private road leading up the ridge near its summit (c. 160 m). The bush was well cut over with old dead trunks in evidence and the live material was taken under the largest trees left, northern rata S12 118552.

HOLOTYPE: Auckland Museum AK72713, 3 mm x 1.7 mm, J.F.G. 11/5/95.

PARATYPES: All from the type locality. AK72714 (7), J.F.G. 11/5/95, NMNZ M.125010 (5), J.F.G. 1/1/90.



Figs 43-49. Anatomy of *Climocella rata* n. sp. Scale lines 43, 44, 45, 47 = 1 mm; 46, 48, 49 = 0.5 mm. Abbreviations as for Figs 18-21. 43. Reproductive system. 44. Penis *in situ* in retracted state. 45. Posterior end of buccal mass and salivary glands. 46. Hermaphroditic gland. 47. Pallial cavity. 48. Spermoviduct in a young adult. 49. Terminal genitalia in a young adult.

OTHER MATERIAL EXAMINED

Coromandel Peninsula: Otama Forest Park T10 545912, 80 m, P.M.; Waitara Rd. T10 555917, 60 m, P.M. 1/3/94; Wharekaho Beach T11 549868, J.F.G. 1/1/77, AK96725; Kauri Grove Track, kahikatea T11 382812, J.F.G. 1/1/78, AK96722; Mill Creek, fern under cliff T11 473766, J.F.G. 1/7/83, AK96715; Kauaeranga Valley, rimu T12 459542, J.F.G. 1/1/79, AK96714 Kopu - Hikuai, S.H.25a, 3.7 km from Kopu end, B.F.H. 5/11/77, M.72365; Paeroa Waihi Hwy. T13 532169, B.F.H. 5/11/77, M.57564. **Great Barrier Island**: Whangaparapara, tawa S09 264501, J.F.G. 12/1/81, AK96724, 1/4/51, M.79251; Kaitoke swamp edge, tawa & nikau S09 286495, J.F.G. 11/1/81, AK96723; Harataonga Scenic Res. T08 308555, J.F.G. 25/3/90, AK96720. **Hapuakohe Range**: Te Hoe, Mangatea Rd., astelia S13 181110, B.F.H. 7/10/78, M.63494. **Hunua Ranges**: Waharau Regional Park, rata S12 125600, AK96716; 0.4 km S of Orere Pt. turnoff S11 088665, D.J.R. 1/1/79, M.103681; Clevedon, Ness Valley, A.G. Beu 8/4/61, M.32160. **Kaimai**: Matamata - Tauranga Rd., rest area at top of range, B.F.H. 2/1/77, M.51900. **Waiheke Island**: P. Anderson 1/4/88, M.96604.

DISTRIBUTION AND HABITAT

The live material at the type locality was found in a dark position in rata (*Metrosideros robusta)* litter and specimens a little further north at Waharau were also found under rata. Several specimens found in the Hapuakohe Range by B. Hazelwood (M.63494) were living under astelia. This was the only species examined in this group to have dark pigmentation over the pallial cavity although all the rest of the animal was pale coloured. Solem (1983: 34) correlates dark body colour with semi-arboreal snails but this particular pigmentation would never show as the shell of *C. rata* is opaque. Very little exploration above ground level for snails has been done around Auckland (Goulstone 1992) but *C. rata* could easily be living in arboreal situations.

DISCUSSION

The overall similarity in shell characters has required anatomical details to reinforce species recognition in *Climocella.* The *Climocella* coloured shells exhibit anatomical similarities though each is clearly different in detail. The species with the unicoloured shells are diverse in their anatomy and quite removed from the coloured shell species. Climo (1973) mentioned the complex penial structure of the Three Kings *C. manawatawhia* (Powell) as compared with *M. eta* (Pfeiffer) sensu Suter 1913. *C. kaitaka,* which has been thought of as a very close relative of *C. manawatawhia* (Climo 1981B:477) has a very simple penial structure. *C. kaitaka* does have more affinity with a similar looking shell from Te Paki in the Far North (Climo 1970:351 fig. C) but *C. haurakiensis* is very different again. The Auckland region has been an obvious centre to start investigating the group because two species have been so common. It seems inevitable that species at present in this holding group will find closer natural affinities in other genera, but I have not explored these options in this paper. I have looked at every shell available for the Auckland area and ended with only about six specimens which did not fit comfortably in the above groups. There has not been that body of hybrid material, defying separation, which seemed a possibility when I started the project. There is another concentration of as yet undescribed *Climocella* in the central North Island (Goulstone unpubl.) Taxonomic treatment of this central North Island material must await further dissection of live material before it can be presented. On evidence to hand, none of the species seem to be particularly threatened, but habitat loss or modification is a threat and

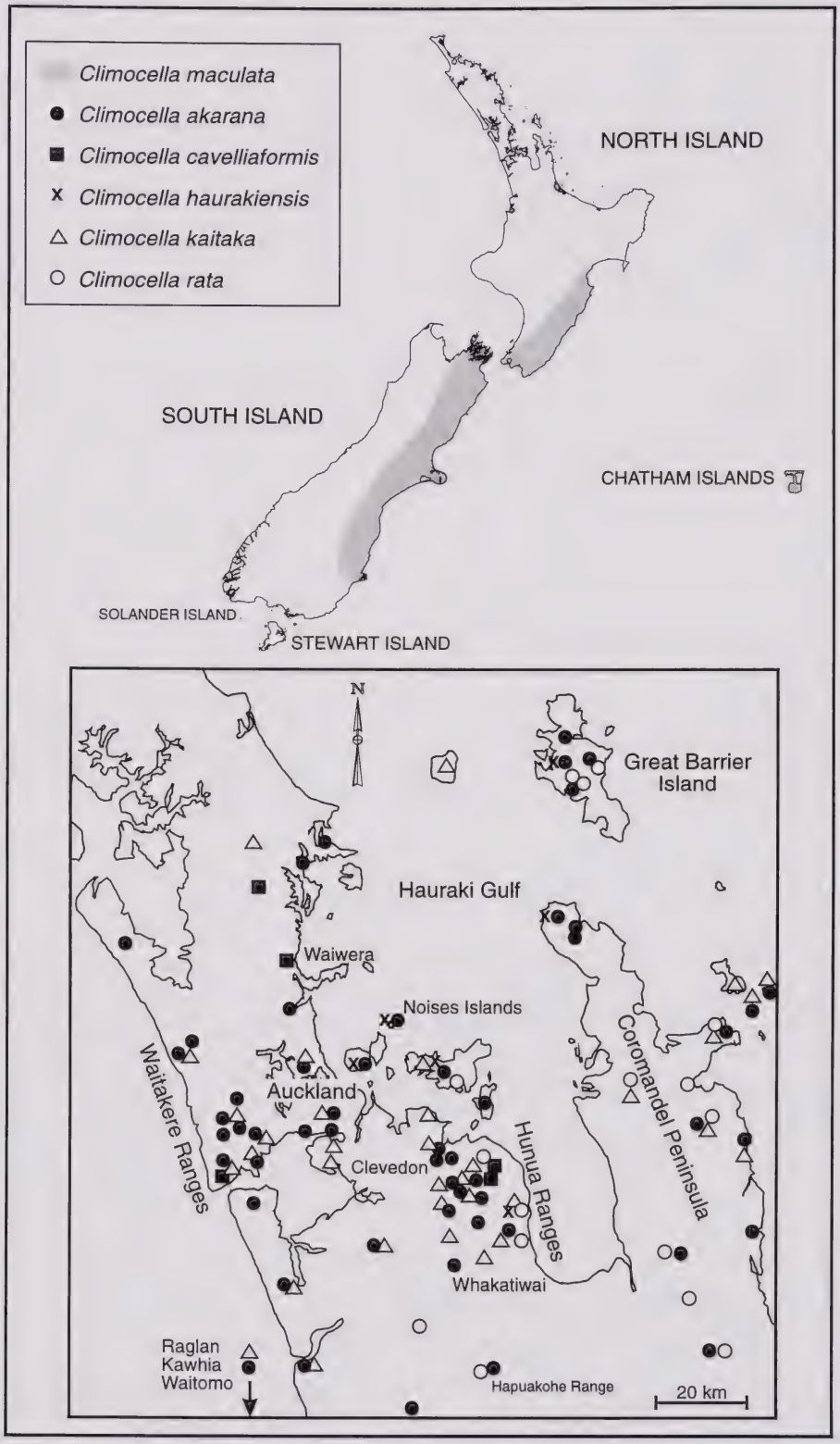


Fig. 50. Distribution of *Climocella* species in the Auckland region and of *C. maculata.*

both *C. cavelliaformis* and *C. haurakiensis,* with the smallest range, are probably dependant on only three or four well protected reserves.

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